Assembly Manual

AMSAR:
Autonomous.Maritime.Search.and.Rescue
Challenge 1: Surface Autonomous Vehicle for Emergency Response (SAVER)

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UB AIAA Micro-g NExT Research Team

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1.0 General Information

The purpose of this manual is to show NASA personnel how to interface properly with AMSAR. This will include how to assemble/disassemble the structure as well as setup the software. The manual will also contain instructions on checking the current condition post delivery.

1.1 Parts

Parts list of all items delivered within the shipment:
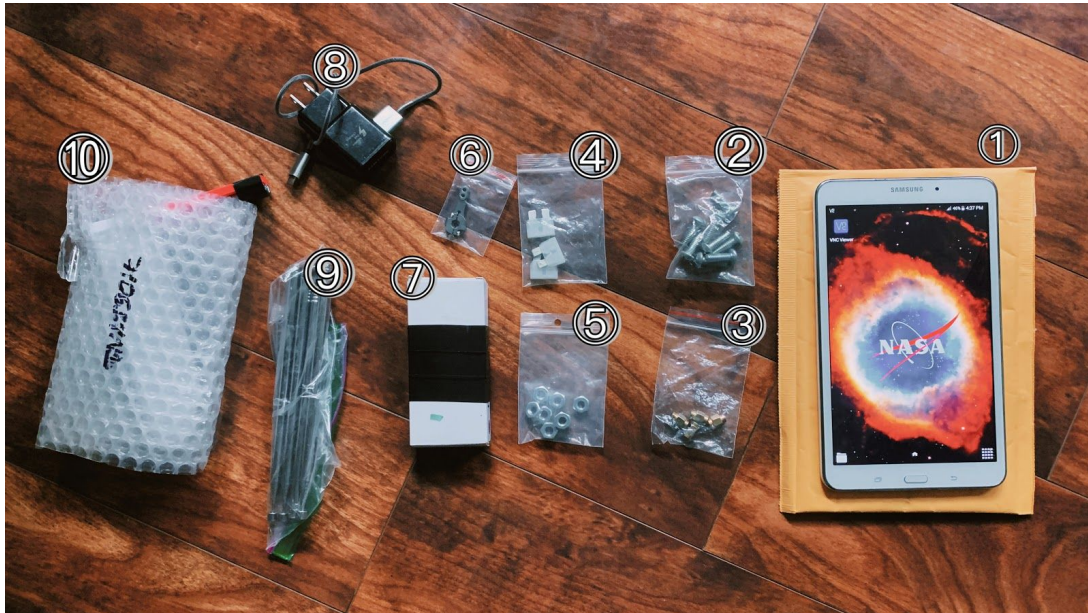
1. 1 x Tablet
2. 8 x (¼ - 20 x ¾ IN Bolts) [Spare]
3. 4 x 50 Ohm Terminators
4. 3 x 25 AMP Fuses
5. 8 x (¼ - 20 Hex Nuts) [Spare]
6. 1 x Servo Rudder Arm [Spare]
7. 4 x 9.5cm Fixed Whip Antenna (usable from 400 MHz to 2 GHz+)
8. 1 x 3 Amp Charger Tablet
9. 4 x 17cm - 100cm Telescopic Whip (usable from 100 MHz - 400 MHz)
10. 1 x Rudder w/M2.5 Machine Screw
11. 1 x AMSAR

1.2 Delivery Condition

Instruction for checking product post delivery:
1. Check for any visible damages to the body of AMSAR.
2. Check for any visible damages on small components such as the *propeller guard*, *ultrasonic mounts*, and *Pi camera mounts*.

3. Check for any visible disconnect/damages on the external wiring, ie. *4 x antenna wires, 2 x ultrasonic sensors, 1 x servo wire, 1 x Pi camera wire*.
4. Follow disassembly (2.1)
5. Check for any visible damages to the body internally.
6. Check for any disconnect/damages on internal wires.

2.1 Structural Disassembly Instructions

1. Unscrew and take out all 29 x (¼ - 20 x ¾ IN Bolts)
   a. Careful not to lose any gaskets as they are not attached to the bolts or body
2. With the nose of the boat being the front, lift the right side of the upper cover carefully noting the wires, place the upper cover to the right side of the boat on a level platform (See picture below for clarification).

3. Refer back to 1.2 to continue

2.2 Structural Assembly Instructions

Fig 1

Fig 2

1. Carefully lay the wires into the inner back hull. The Coax cables may be laid in the rear below the polycarbonate sheet with light force.
2. Lay the upper cover on top of the hull, be sure that they are sitting flush and no wiring inside blocking bolt holes.
3. Place the support (6)? in figure 2 in its correct position as seen in figure 1. Be sure that the last bolt facing the rear has a double gasket.
4. Screw the rest of the ¼ - 20 bolts in be sure that the size is variable depending on if there is a mount.
5. Screw the servo mount (3) in as seen on figure with ¼ - 20 x 1½ IN bolts.
6. Screw the USS mount (1 & 2) in as seen on figure with ¼ - 20 x 1 IN bolts.
7. Adjust both USS angles to be set in the middle of the mount range.
8. Unscrew the Pi Camera bolt in order to put it upright at $90°$, then re-tighten.
9. Attach rudder to servo using M2.5 Machine Screw. Disregard the servo moving as it will recalibrate on start up.

## 2.3 Software Setup

2.3.1 Software startup:

1. Power on tablet
2. Tablet will be unlocked, swipe open to unlock

3. Open main app on front page "VNC Viewer", AMSAR window will be visible for connection (will not connect if selected)
4. Power on AMSAR
5. Wait around 1 minute for AMSAR to boot
6. Select the "AMSAR" window in "VNC viewer".
7. Tablet will now display one of the internal Raspberry Pi's Desktops

2.3.2 Testing Manually:

Startup

1. Select terminal as seen below
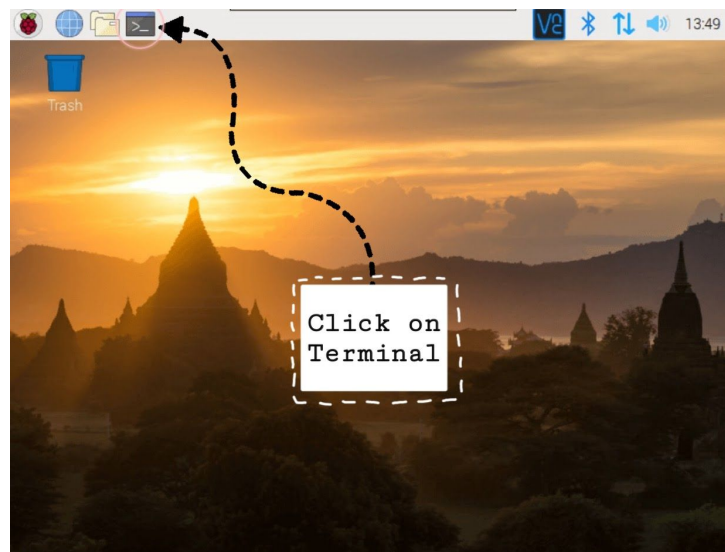
2. Type ". manual.sh"
3. Press enter
4. A small Pygame Window will open, and the terminal will show you the details of input commands.
5. Follow the controls command ahead.

Controls

1. Press the left arrow on the tablet's keyboard to turn the servo rudder left.
2. Press the right arrow on the tablet's keyboard to turn the servo rudder back to its straight position.
3. Press the right arrow on the tablet's keyboard to turn the servo rudder right.
4. Press "I" on the keyboard to calibrate the motor, wait for the beep sound for confirmation

5. Press up arrow on the tablet's keyboard to increase the acceleration, the motor RPM will be displayed in the terminal
6. Press down arrow on the keyboard to decrease the acceleration.
7. Press "q" on the keyboard to quit the program.
8. NOTE: The recommended acceleration is 1400.
9. WARNING: Careful exceeding 1600 RPM

2.3.3 Testing Autonomously:

1. Select terminal/open new terminal
2. Type ". startup.sh"
3. The boat is now ready for the drop impact to initiate/trigger the rest of the software.

3.0 Debugging

Q. Why is Manual.sh not running?

1. Make sure you are in the correct directory, the file is in /home/pi.
2. Make sure the command to run the file matches the given command

   ". Manual.sh"

   Note - There is a space after the first period.

3. If nothing above works, Please reopen the terminal and try again.

Q. Why is Manual.sh not working properly?

- Make sure the small Pygame window is selected by the cursor.
- Make sure the Motor is calibrated, press "I" upon running the file.

Q. Why is Pi not booting up?

1. Make sure the power supply to both Pis are plugged in.
2. Unplug the power supply, and plug it again. Give the system 1 minute to connect to the provided tablet.

Q. Unable to connect to the pi via tablet?

1. Click on the app drawer on the bottom right corner, and then click on settings. Click on Wifi and look for "Kerberos Pi" network and connect.
2. If unable to find the network, restart the system by unplugging power and plugging back in. Wait for 1 minute for initialization and repeat step 1.

Q. Ultrasonic Sensors not reading properly (999cm+)?

1. Adjust the angle of the USS mounts, if this step does not fix, refer to the next step.
2. (Hazard: Power Off) Primary cause of this is due to a disconnect between USS wire and board. Follow the disassembly instructions to get access to the USS Board. Reach below the polycarbonate sheet and make sure the USS wire is firmly connected to the board.
3. USS board or sensor can be damaged causing false readings.